# METHOD AND APPARATUS IN A TWO-WAY WIRELESS COMMUNICATION SYSTEM FOR DETECTION AND DEFERRED REPORTING OF A COMMUNICATION DIFFICULTY

## FIELD OF THE INVENTION

This invention relates in general to wireless communication systems, and more specifically to a method and apparatus in a two-way wireless communication system for detection and deferred reporting of a communication difficulty.

## BACKGROUND OF THE INVENTION

System coverage is an important aspect of a wireless communication system. Holes in coverage can cause dropped calls and missed messages, which can anger subscribers and cause them to move their business to another service provider. For this reason, many service providers put considerable effort and money into evaluating the coverage performance of their systems to identify and correct areas of bad coverage.

Prior-art diagnostic systems for wireless communication systems have operated to report a communication difficulty either immediately after its occurrence, or as soon as contact is reestablished with a base station. Such "real-time" reporting causes additional traffic in the communication system, with no control of the timing of the additional traffic. Because many communication difficulties, e.g., high interference and congestion, occur during high-traffic conditions, real-time diagnostic reports can exacerbate the problem.

Thus, what is needed is a method and apparatus in a two-way wireless communication system for detection and deferred reporting of a communication difficulty and a location at which the communication difficulty occurred. Preferably, the method and apparatus will be automated, comprehensive, cost effective, and will allow diagnostic reports to be transmitted at off-peak times.

## SUMMARY OF THE INVENTION

An aspect of the present invention is a method in a two-way wireless communication system for detection and deferred reporting of a communication difficulty and a location at which the communication difficulty occurred. The method comprises in a portable subscriber unit the steps of providing communications for a user, and monitoring a parameter indicative of communication quality during the communications. The method further comprises the steps of comparing the parameter with a predetermined threshold; and when the communication quality deteriorates such that the parameter reaches the predetermined threshold, performing the steps of determining geographic coordinates corresponding to the location at which the communication difficulty occurred, and adding a communication difficulty report to a record of communication difficulty reports stored in the portable subscriber unit, the communication difficulty report identifying the parameter and the geographic coordinates. The method further comprises in the portable subscriber unit the steps of receiving a request for the record of communication difficulty reports from a fixed portion of the twoway wireless communication system, and communicating the record of communication difficulty reports to the fixed portion in response to the request.

Another aspect of the present invention is a portable subscriber unit in a two-way wireless communication system for detection and deferred reporting of a communication difficulty and a location at which the communication difficulty occurred. The portable subscriber unit comprises a receiver for receiving a first communication from a fixed portion of the two-way wireless communication system, and a processing system coupled to the receiver for processing the first communication. The portable subscriber unit further comprises a transmitter coupled to the processing system for transmitting a second communication to the fixed portion. The processing system is programmed to monitor a parameter indicative of communication quality during at least one of the first and second communications, and to compare the parameter with a predetermined threshold. When the communication quality deteriorates such that the parameter reaches the predetermined threshold, the processing system is further programmed to determine geographic coordinates corresponding to the location at which the communication difficulty occurred, and to add a communication difficulty report to a record of communication difficulty reports stored in the processing system, the communication difficulty report identifying the parameter and the geographic coordinates. The processing system is further programmed to receive a request for the record of communication difficulty reports from a fixed portion of the two-way wireless communication system, and to communicate the record of communication difficulty reports to the fixed portion in response to the request.

Another aspect of the present invention is a controller in a wireless communication system, comprising a network interface for receiving a message from a message originator, and a processing system coupled to the network interface for processing the message. The controller further comprises a base station interface coupled to the processing system for communicating with a portable subscriber unit through a base station. The processing system is programmed to receive and store a plurality of records of communication difficulty reports received from a plurality of portable subscriber units, and to process the plurality of records to create a system coverage map.



## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an electrical block diagram of an exemplary wireless communication system in accordance with the present invention.

FIG. **2** is an electrical block diagram of an exemplary portable subscriber unit in accordance with the present invention.

FIG. **3** is an electrical block diagram of an exemplary controller in accordance with the present invention.

FIG. **4** is a flow diagram depicting operation of the portable subscriber unit in accordance with a first aspect of the present invention.

FIG. **5** is a flow diagram depicting operation of the portable subscriber unit in accordance with a second aspect of the present invention.

FIG. **6** is a flow diagram depicting operation of the controller in accordance with a third aspect of the present invention.

FIG. **7** is diagram depicting an exemplary structure for the record of communication difficulty reports in accordance with the present invention.

## DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIG. **1**, an electrical block diagram depicts an exemplary wireless communication system in accordance